Monolithic Digital IC

LB1409

Level Meter Driver for 9 LEDs

Applications

- AC level meters such as VU meters.
- DC level meters such as signal meters.

Functions

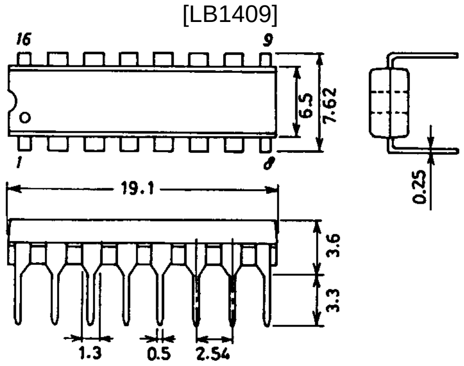
- Display
  Nine red or green LEDs display the input level in the shape of a bar.
- Input amplifier
  Wide application is available owing to built-in DC amplifier whose gain is variable with external resistors.
- Comparator level
  Setting is made by steps of 3 dB as follows.
  –18 dB, –15 dB, –12 dB, –9 dB, –6 dB, –3 dB, 0 dB, +3 dB, +6 dB
- Supply voltage
  The recommended supply voltage range is so wide as 5.5 V to 16 V.
  (If pin Vref 2 is used, 7 V to 16 V.)
- Reference voltage
  Constant voltage output is available with external transistor owing to pin Vref 2 = 5 V.

Package Dimensions

unit : mm

3064-DIP16

[LB1409]



SANYO : DIP16

Specifications

Comparator Level OUT Pin Voltage at Ta = 25°C, V_{CC} = 12 V, Vref 1 = 3 V

Comparator level	Pin No.	min	typ	max	Unit
D1	7	0.11	0.18*	0.25	V
D2	8	0.20	0.27*	0.34	V
D3	9	0.30	0.38*	0.46	V
D4	10	0.45	0.53*	0.61	V
D5	11	0.66	0.75	0.84	V
D6	12	0.97	1.06	1.15	V
D7	13	1.40	1.50	1.60	V
D8	14	2.02	2.12	2.22	V
D9	15	2.90	3.00	3.10	V

*: No overlap occurs in each individual IC.

Absolute Maximum Ratings at Ta = 25°C

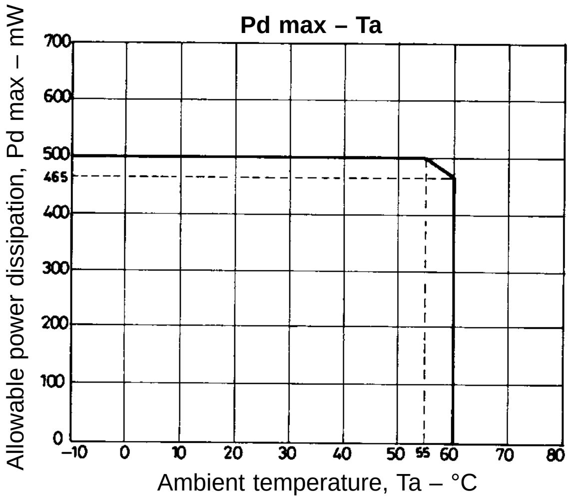
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	Pin 1	−0.3 to +18	V
Input voltage	V_{IN}	Pin 3, 4	−0.3 to V_{CC}	V
D1 to D9 output voltage	V_{OUT} (D)	D1 to D9 off	−0.3 to +18	V
D1 to D9 output current	I_{OL} (D)	Pin 7 to 15, D1 to D9 on	+30	mA
First reference flow-out current	Iref (1)	Pin 2	−1 to 0	mA
Second reference flow-out current	Iref (2)	Pin 16	−6 to 0	mA
V_{OUT} supply voltage	V_{OUT}	Pin 5	−0.3 to +6	V
Allowable power dissipation	Pd max	Ta = 55°C	500	mW
Operating temperature	Topr		−10 to +60	°C
Storage temperature	Tstg		−40 to +125	°C

Allowable Operating Ranges at Ta = 25°C

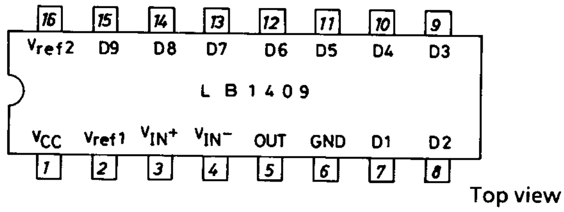
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	Pin 1, ( ): Using Vref 2	+5.5 to +16	V
			(+7 to +16)	V
Input voltage	V_{IN}^+ or V_{IN}^-	Pin 3 or Pin 4	–0.3 to $+V_{CC}$	V
Output pin load resistance	R_L	Between pin 5 OUT and pin 6 GND.	15 k to 20 k	Ω

Electrical Characteristics at Ta = 25°C, V_{CC} = 12 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Input bias current (Amplifier)	I_{IN}^+ (A)	Pin 3, V_{IN}^+ = 0 V, V_{IN}^- = 3 V, GND = 0 V	–2		0	µA
	I_{IN}^- (A)	Pin 4, V_{IN}^+ = 3 V, V_{IN}^- = 0 V, GND = 0 V	–2		0	µA
Input bias current (Comparator) + Output leakage current	I_{IN}^+ (C)$^+$ I_{OL} (A)	Pin 5, V_{IN}^+ = 0 V, V_{IN}^- = 3 V, OUT = 0 V, GND = 0 V	–10		0	µA
Offset voltage (1)	Voffset (1)	Pin 5, V_{CC} = 6 V, V_{IN}^+ = V_{IN}^- = 0 V, GND = –6 V, GAIN = 20 dB	–180		+180	mV
Offset voltage (2)	Voffset (2)	Pin 5, V_{IN}^+ = V_{IN}^- = 0 V, GND = 0 V, GAIN = 20 dB	0		+180	mV
First reference voltage	Vref (1)	Pin 2, Iref = 0 to 1 mA	2.6		3.0	V
Second reference voltage	Vref (2)	Pin 16, Iref = 0 to 6 mA	4.2	4.7	5.2	V
Current drain	I_{CC}	Pin 1, V_{IN}^+ = 3 V, V_{IN}^- = 0 V		10	20	mA
Amplifier gain	VG	Open loop	30			dB
Output flow-out current	I_{OH}	Pin 5, V_{IN}^+ = 3 V, V_{IN}^- = 0 V, V_{OUT} = 0 V			–10	mA
D pin output ON voltage	V_{OL} (D)	Pin 7 to 15, D1 to D9, I_{OL} = 20 mA, V_{IN}^+ = 3 V, V_{IN}^- = 0 V			1.2	V
D pin output leak current	I_{OH} (D)	Pin 7 to 15, D1 to D9, V_{IN}^+ = 0 V, V_{IN}^- = 3 V, $V_{D1\ to\ D9}$ = 12 V			10	µA
Output voltage (Amplifier)	V_{OH}	Pin 5, V_{CC} = 5.5 V, V_{IN}^+ = 3 V, V_{IN}^- = 0 V, R_L = 15 kΩ	4			V
		Pin 5, V_{CC} = 12 V, V_{IN}^+ = 3 V, V_{IN}^- = 0 V, R_L =15 kΩ	9.5			V

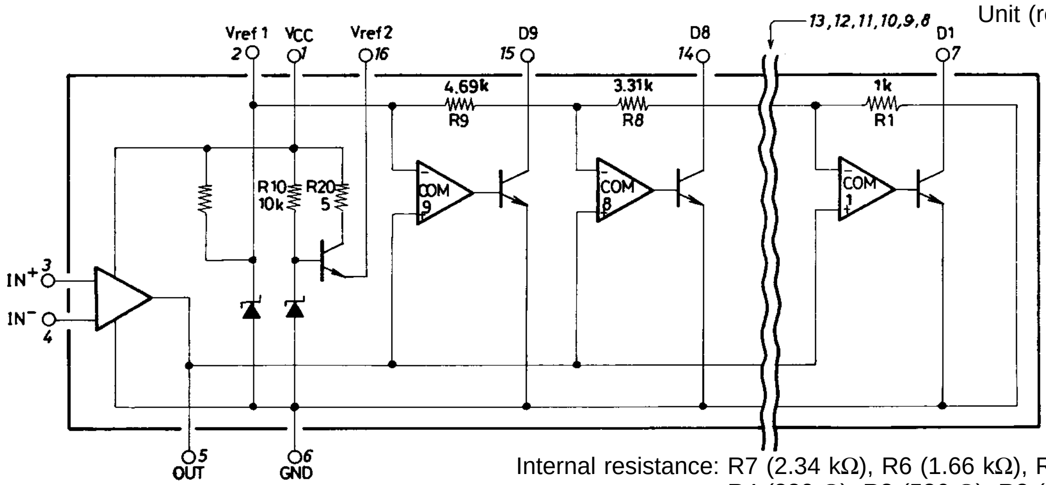


Pin Assignment



Equivalent Circuit

Unit (resistance: Ω)

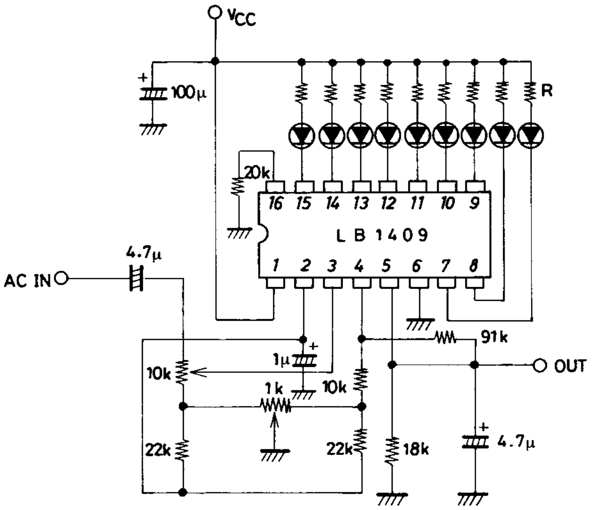


Internal resistance: R7 (2.34 kΩ), R6 (1.66 kΩ), R5 (1.17 kΩ), R4 (830 Ω), R3 (586 Ω), R2 (414 Ω)

Sample Application Circuits

(All with offset adjustment)

• **Circuit not using Vref 2**

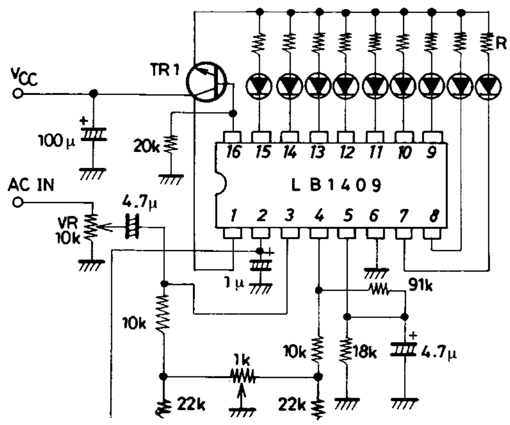


Adjusting procedures

1. Turn the center of 10 kΩ VR largely to 4.7 μF capacitor side.
2. Input AC signal of 50/√2 mV from AC IN.
3. Adjust 1 kΩ VR so that the output at OUT becomes 500 mV DC.
   Equation used in the calculation of R to be inserted in series with LED.
   Gain : 20 dB
   R (red) = (V_{CC} – 2.5) / 6 kΩ
   R (green) = (V_{CC} – 2.8) / 18 kΩ

Unit (resistance: Ω, capacitance: F)

• **Circuit using Vref 2**



Adjusting procedures

• R to be inserted in series with LED is as follows irrespective of V_{CC}.
  R (red) = 360 Ω (Approx. 6 mA)
  R (green) = 100 Ω (Approx. 18 mA)

• TR1 should be chosen with P_C considered; and the following transistors are recommended.
  Red LED drive 2SD400
  Green LED drive 2SD325

Unit (resistance: Ω, capacitance: F)

This catalog provides information as of May, 1996. Specifications and information herein are subject to change without notice.